

**WHAT IS CLAIMED IS:**

1. A fuel injection control apparatus for an in-cylinder injection type internal combustion engine for controlling a quantity of fuel to be directly injected into a cylinder upon start-up of the internal combustion engine, the fuel injection control apparatus comprising:

a controller that extends an allowable crank angle range that allows the fuel injection within a predetermined period of time subsequent to an initial combustion of the fuel injected upon the start-up of the internal combustion engine such that the extended allowable crank angle range after passage of the predetermined period of time becomes larger than the allowable crank angle range within the predetermined period of time.

2. The fuel injection control apparatus according to claim 1, wherein the controller sets a fuel injection period within the predetermined period of time to the allowable crank angle range within the predetermined period of time.

3. The fuel injection control apparatus according to claim 1, wherein the controller sets a fuel injection period after passage of the predetermined period of time to the extended allowable crank angle range.

4. The fuel injection control apparatus according to claim 1, wherein the controller sets the predetermined period of time to a period that is taken for an engine speed of the internal combustion engine to exceed a predetermined engine speed.

5. The fuel injection control apparatus according to claim 1, wherein the controller makes the allowable crank angle range within the predetermined period of time variable in accordance with at least one of an operating environment and an operating state of the internal combustion engine upon the start-up thereof.

6. The fuel injection control apparatus according to claim 1, wherein the controller makes the extended allowable crank angle range variable in accordance with at least one of an operating environment and an operating state of the internal combustion engine upon the start-up thereof.

7. The fuel injection control apparatus according to claim 1, wherein the controller extends the allowable crank angle range prior to the predetermined period of time so as to be larger than the allowable crank angle range within the predetermined

period of time.

8. A fuel injection control apparatus for an in-cylinder injection type internal combustion engine for controlling a fuel injection quantity upon start-up of the internal combustion engine, the fuel injection control apparatus comprising:

a calculating device that calculates a command value for controlling the fuel injection quantity into a cylinder of the internal combustion engine; and

a controller that executes a fuel injection control based on the calculated command value, wherein the controller:

forcibly decreases the command value for controlling the fuel injection quantity for a predetermined period of time after an initial combustion of the fuel injected upon the start-up of the internal combustion engine; and

stops the forcible decrease in the command value after passage of the predetermined period of time.

9. A fuel injection control method for an in-cylinder injection type internal combustion engine for controlling a quantity of fuel to be directly injected into a cylinder upon start-up of the internal combustion engine, the fuel injection control method comprising the step of:

extending an allowable crank angle range that allows the fuel injection within a predetermined period of time subsequent to an initial combustion of the fuel injected upon the start-up of the internal combustion engine such that the extended allowable crank angle range after passage of the predetermined period of time becomes larger than the allowable crank angle range within the predetermined period of time.

10. The fuel injection control method according to claim 9, wherein a fuel injection period within the predetermined period of time is set to the allowable crank angle range within the predetermined period of time.

11. The fuel injection control method according to claim 9, wherein a fuel injection period after passage of the predetermined period of time is set to the extended allowable crank angle range.

12. The fuel injection control method according to claim 9, wherein the predetermined period of time is set to a period that is taken for an engine speed of the

internal combustion engine to exceed a predetermined engine speed.

13. The fuel injection control method according to claim 9, wherein the allowable crank angle range within the predetermined period of time is made variable in accordance with at least one of an operating environment and an operating state of the internal combustion engine upon the start-up thereof.

14. The fuel injection control method according to claim 9, wherein the extended allowable crank angle range is made variable in accordance with at least one of an operating environment and an operating state of the internal combustion engine upon the start-up thereof.

15. The fuel injection control method according to claim 9, wherein the allowable crank angle range prior to the predetermined period of time is extended so as to be larger than the allowable crank angle range within the predetermined period of time.

16. A fuel injection control method for an in-cylinder injection type internal combustion engine for controlling a fuel injection quantity upon start-up of the internal combustion engine, the fuel injection control method comprising the steps of:

calculating a command value for controlling the fuel injection quantity into a cylinder of the internal combustion engine; and

executing a fuel injection control based on the calculated command value,  
wherein:

the command value for controlling the fuel injection quantity is forcibly decreased for a predetermined period of time after an initial combustion of the fuel injected upon the start-up of the internal combustion engine; and

the forcible decrease in the command value is stopped after passage of the predetermined period of time.